WTCI-470-P

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20-251E

September 12, 2003

Dr. William Pitts
National Institute of Standards & Technology
100 Bureau Drive-Mail Stop 8662
Gaithersburg, MD 20899-3571

Re: **World Trade Center**
New York, New York

Dear Dr. Pitts:

Transmitted herewith is a complete set of the Merritt & Harris, Inc. photographs included in our Report 20-251E as requested by Mr. Harold Nelson. Permission for this release was granted by Mr. Frank Lombardi of the Port Authority of New York and New Jersey.

Very truly yours,

MERRITT & HARRIS, INC.

Robert G. Weiland, R.A.
Vice President

cc: Port Authority of New York and New Jersey
Attn: Saroj Bhol with Photographs
Attn: Frank Lombardi - Transmittal Only

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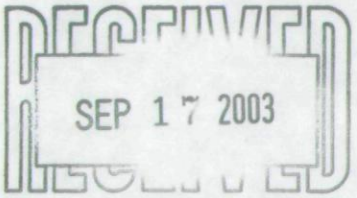

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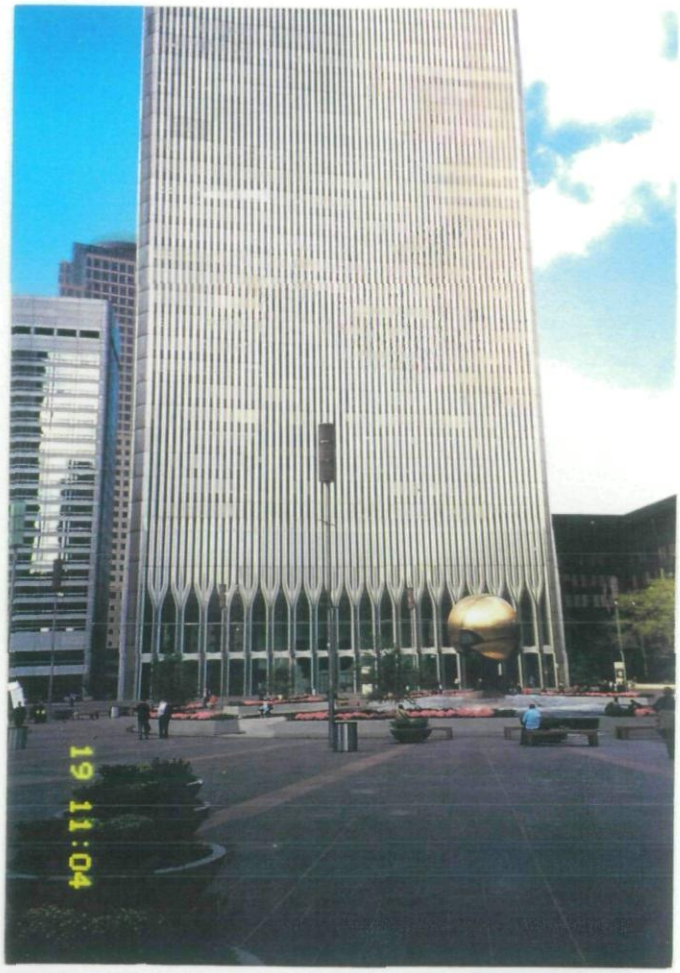
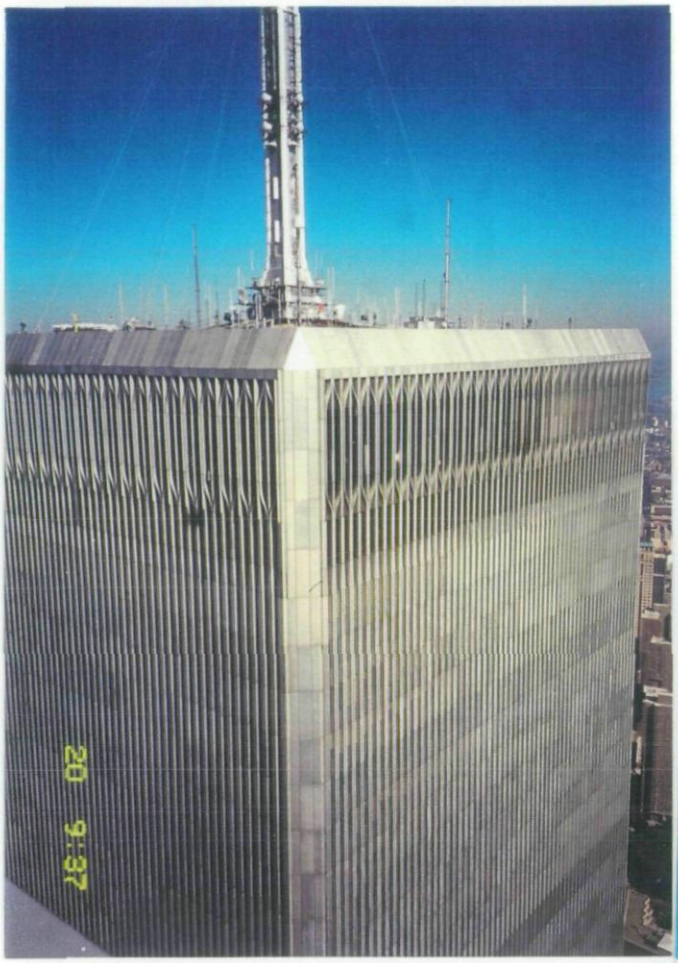


Photograph 1

Front plaza level entrance (east)

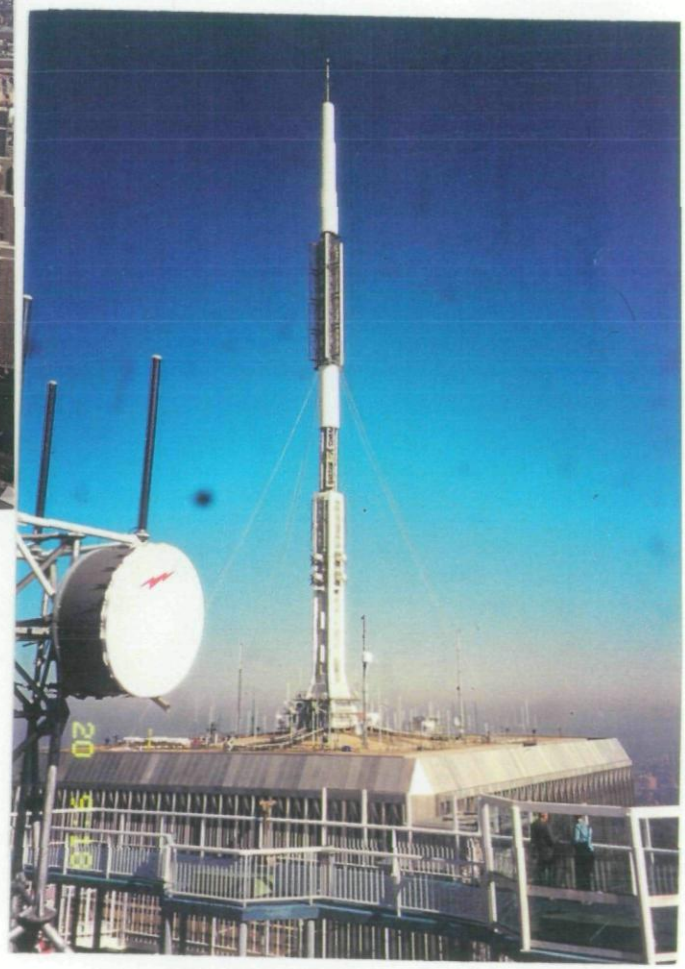
Photograph 2

West Street Entrance to Lobby



Photograph 3

Rooftop and antenna



Photograph 4

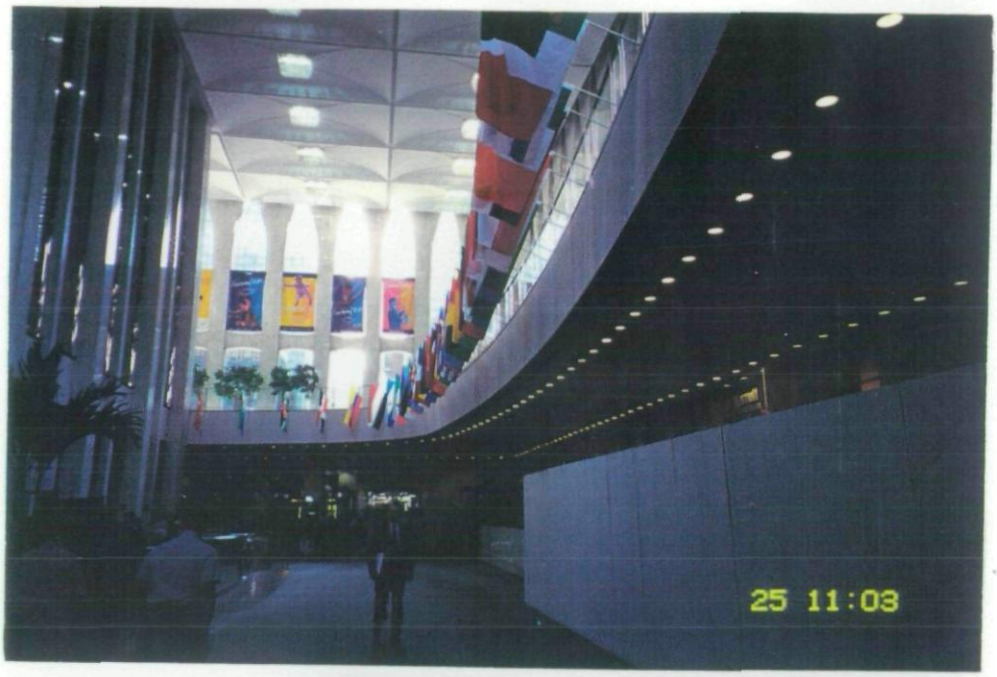
Antenna

Photograph 5

Window washing rig

Photograph 6

Typical setback at MER levels



Photograph 7

Lobby with plaza level mezzanine above

Photograph 8

Lobby and elevator banks

Photograph 9

Lobby entrance from mall, and escalators to mezzanine

Photograph 10

Lobby entrance and vestibule on West Street

Photograph 11

Lobby suspended plaster ceiling panels

Photograph 12

Typical multi-tenanted floor corridor

Photograph 13

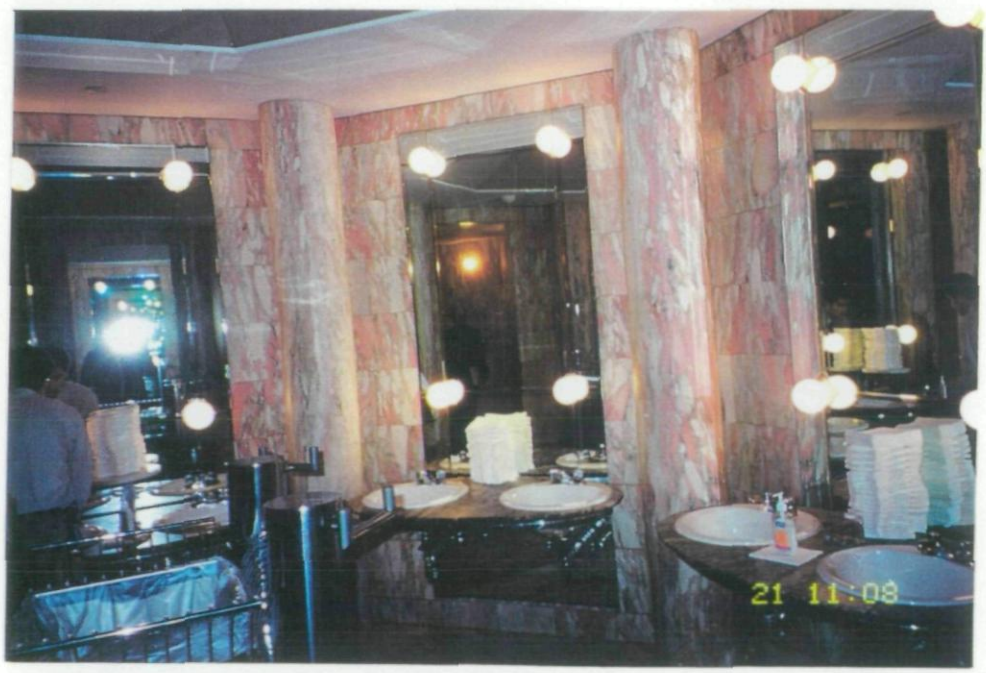
Typical multi-tenanted floor elevator vestibule

Photograph 14

Typical office

Photograph 15

Vacant space



Photograph 16

Windows on the World rest room

Photograph 17

Port Authority Cafeteria on 43rd floor

Photograph 18

Port Authority Cafeteria on 43rd floor

Photograph 19

Upgraded toilet room

Photograph 20

Elevator vestibule Level B3 for garage

Photograph 21

Bent stair nosing on wide stairs.

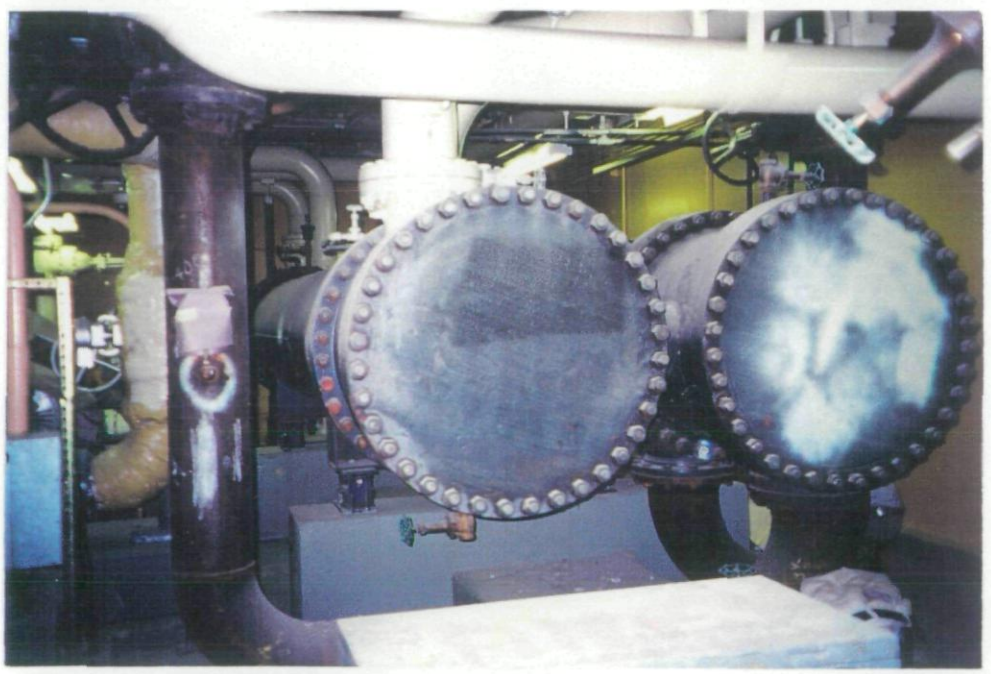
Photograph 22

Viscoelastic damper at each floor joist.

119

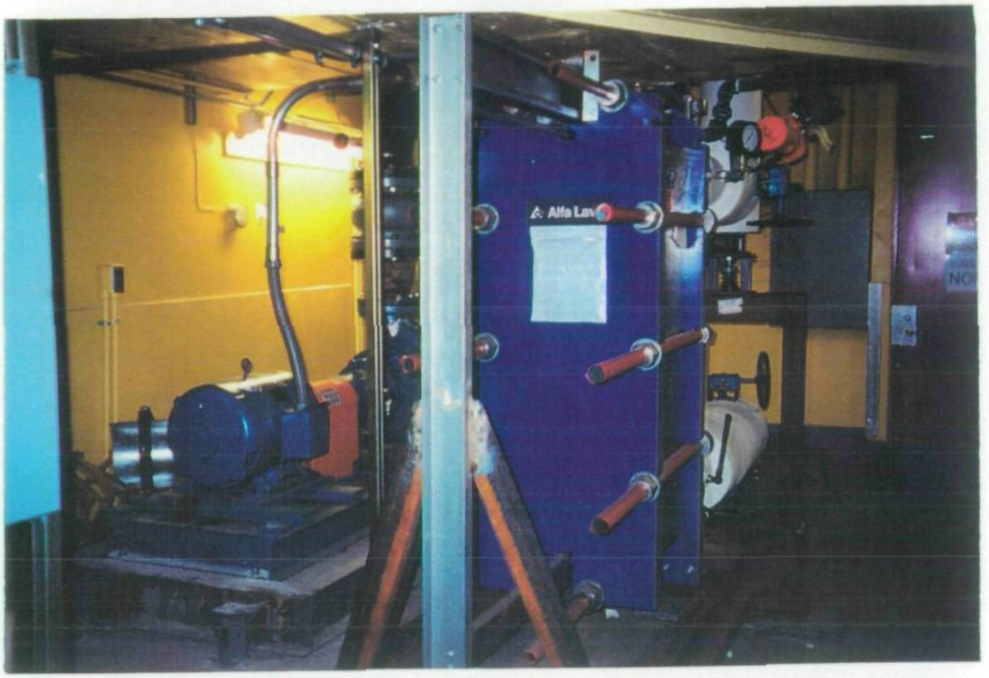
Photograph M1

Condenser water system #2 pump



Photograph 2

Condenser water system #2 heat exchangers

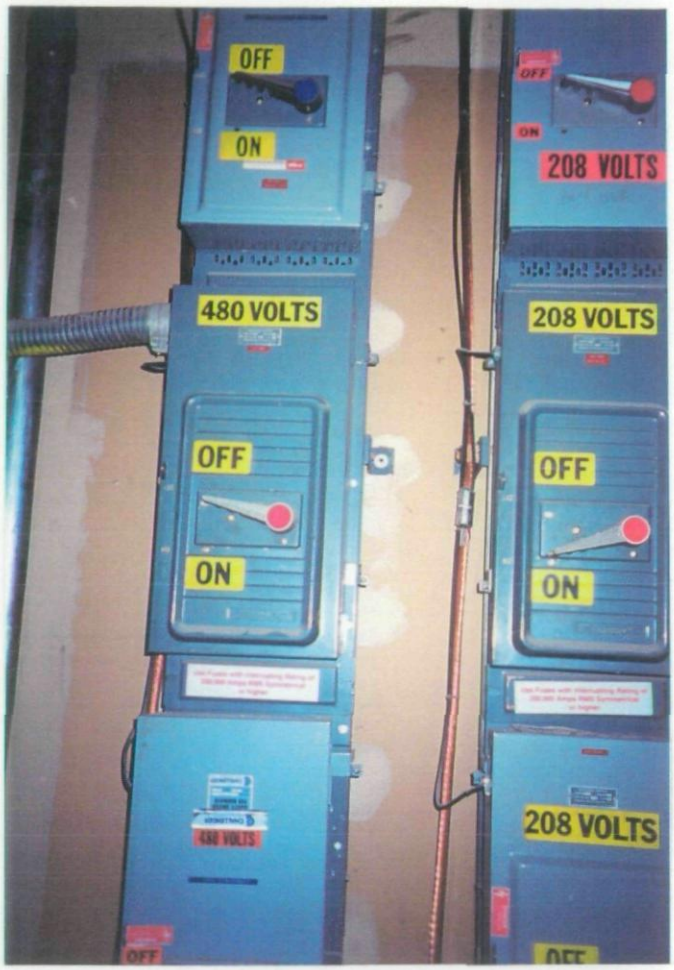


Photograph M3

New condenser water system #2 pump and plate and frame heat exchanger

Photograph M4

New freeze protection system chilled water pumps



Photograph M5

480 volt and 208 volt electric bus duct risers located in a typical electric closet

Photograph M6

5,000 gal. standpipe fire reserve tank

116

Photograph M7

Typical floor sprinkler control valve room with sprinkler supply line and flow and tamper switches

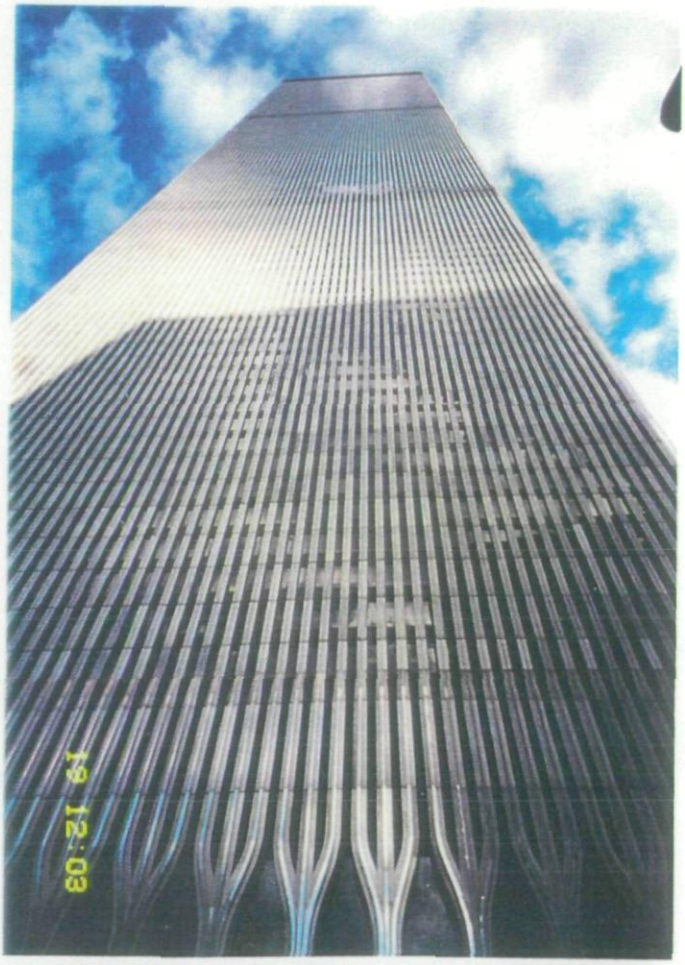
Photograph M8

Standpipe riser with a fire hose rack, and fire extinguisher cabinet located in the stairs

PhotographM9

Typical office floor corridor with an exit sign, manual pull station, fire warden station, and audio/visual alarm

114



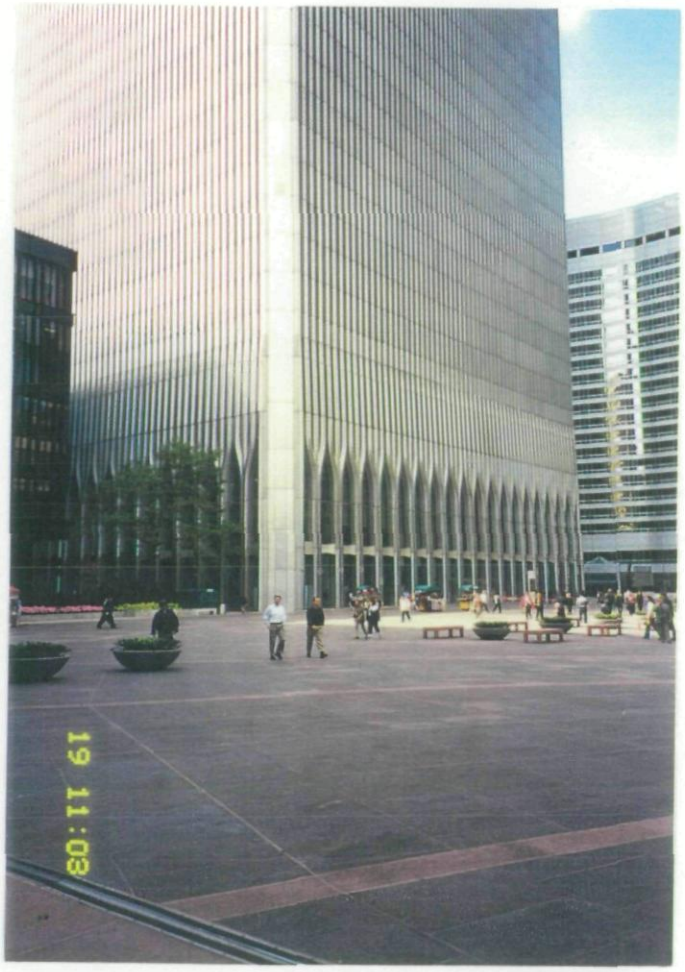
Photograph 1

Liberty Street elevation

Photograph 2

Liberty Street entrance to Lobby

113



Photograph 3

Plaza elevation, Marriott hotel in background

Photograph 4

Rooftop observation deck, window washing rig

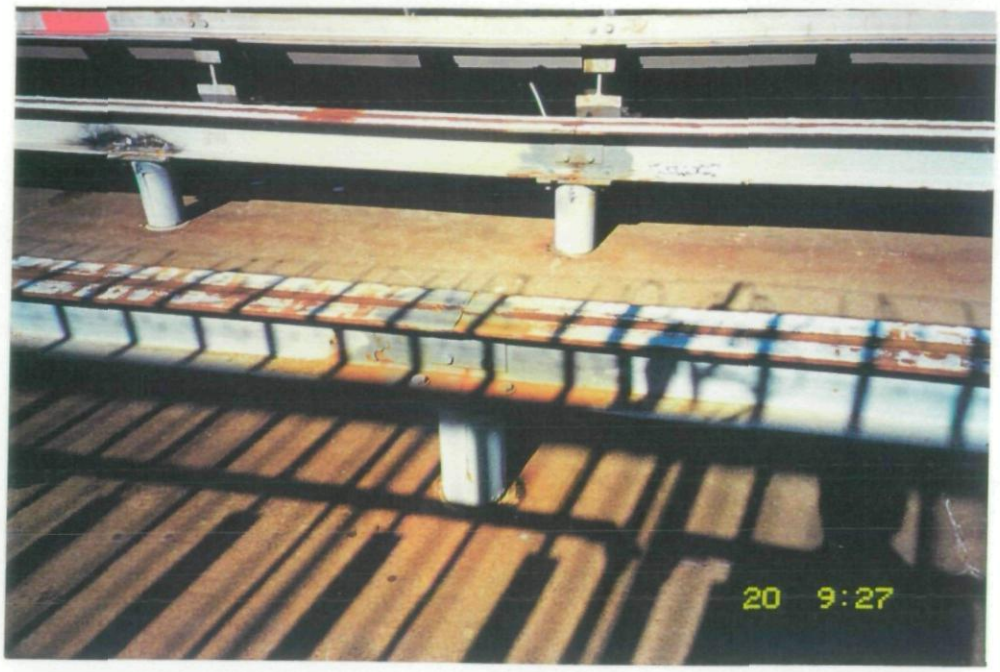
112

Photograph 5

Entrance to rooftop observation deck; note concrete covered roof

Photograph 6

Helicopter pad



Photograph 7

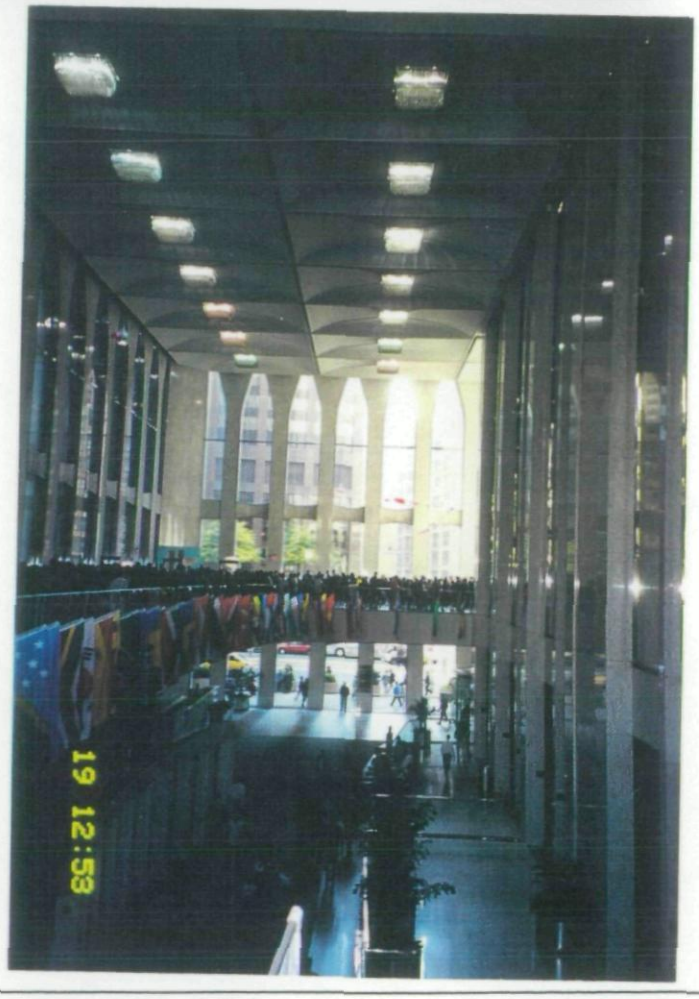
Rusted window washing rig rails

Photograph 8

Rusting purlins for exposed facade at 110-story and at roof

Photograph 9

Puddles at main roof indicate poor drainage



Photograph 10

Lobby and mezzanine

Photograph 11

Lobby - visitors desk on left, security gates to elevators on right

Photograph 12

Lobby, secured entrance to elevators to garage on right

108

Photograph 13

Vacated desks in lobby

Photograph 14

Lobby and vestibule entrance from Liberty Street

107

Photograph 15

ADA accessible entrance from mall

Photograph 16

Typical sky lobby

106

Photograph 17

Typical multi-tenant elevator vestibule

Photograph 18

Typical toilet room with original finishes

Photograph 19

Observation deck cafeteria

Photograph 20

Observation deck eating area

Photograph 21

Typical floor office interior

Photograph 22

Viscoelastic damper at each floor joist

103

Photograph 23

Typical floor framing system after fireproofing respraying

Photograph 24

Upgraded elevator lobby, by tenant

Photograph M1

Typical 7th floor mechanical room air handler and abandoned freeze protection pump system

Photograph M2

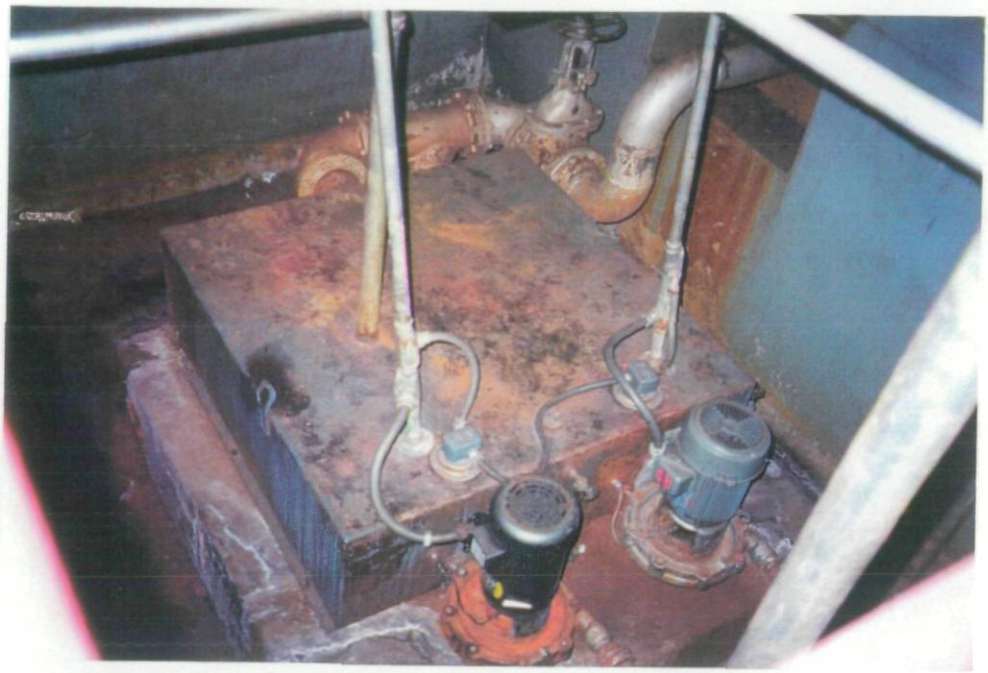
New air handling unit for the electrical substation on the 74th floor

Photograph M3

Steam pressure reducing station

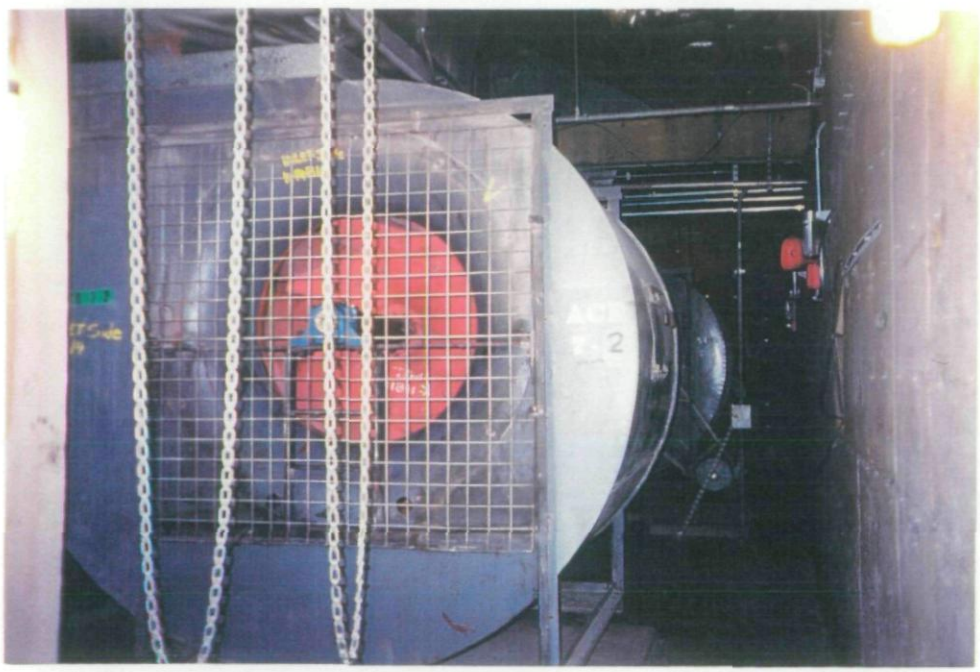
Photograph M4

Steam and chilled water heat exchangers and secondary heating/chilled water pumps



Photograph M5

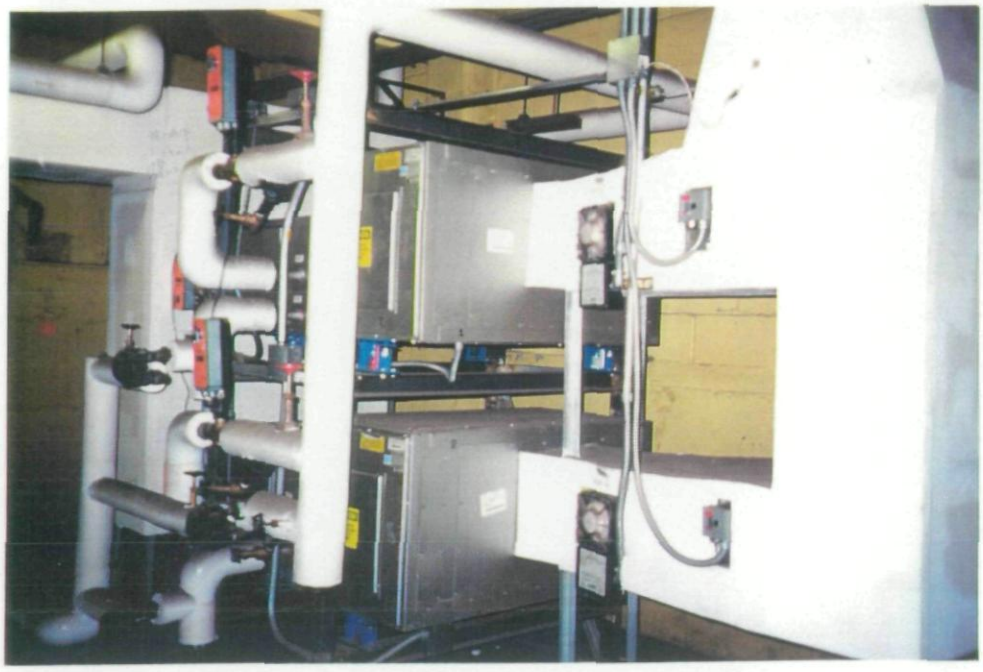
Steam condensate return pumps and receiver in the B-6 Level mechanical room



Photograph M6

7th floor *mechanical room* air handler return air fan

99



Photograph M7

New H&V units, with steam coils, located in the B-6 Level mechanical room

Photograph M8

Domestic water pressure reducing station

Photograph M9

Domestic water booster pump

Photograph M10

Domestic water preheat tank

97

Photograph M11

Steam and electric domestic water heaters and circulating pumps

Photograph 12

Large electric water heater

Photograph M13

Electric fire pump located in the 7th floor mechanical room

Photograph M14

Standpipe riser with a fire hose rack and fire extinguisher cabinet located in the stairs

95

Photograph M15

Fire alarm panels for the new system being installed

Photograph M16

Duct smoke detectors for a typical air handler

Photograph M17

Exit sign, manual pull station, and alarm

Photograph 1

Austin Tobin Plaza looking southwest

Photograph 2

Sidewalk, curb, and planter details on sidewalk looking west along Vesey Street

Photograph 3

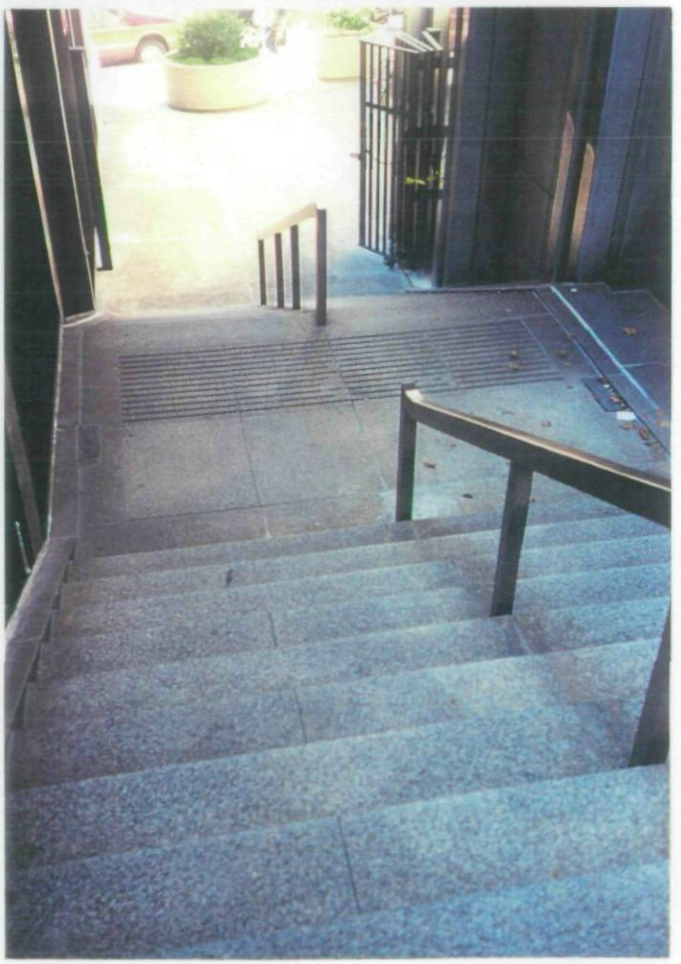
Sidewalk conditions along Vesey Street near West Broadway

Photograph 4

Sidewalk *replacement in* progress West Street near Customs House

Photograph 5

Vehicular drop off at entrance to 1 WTC on West Street



Photograph 6

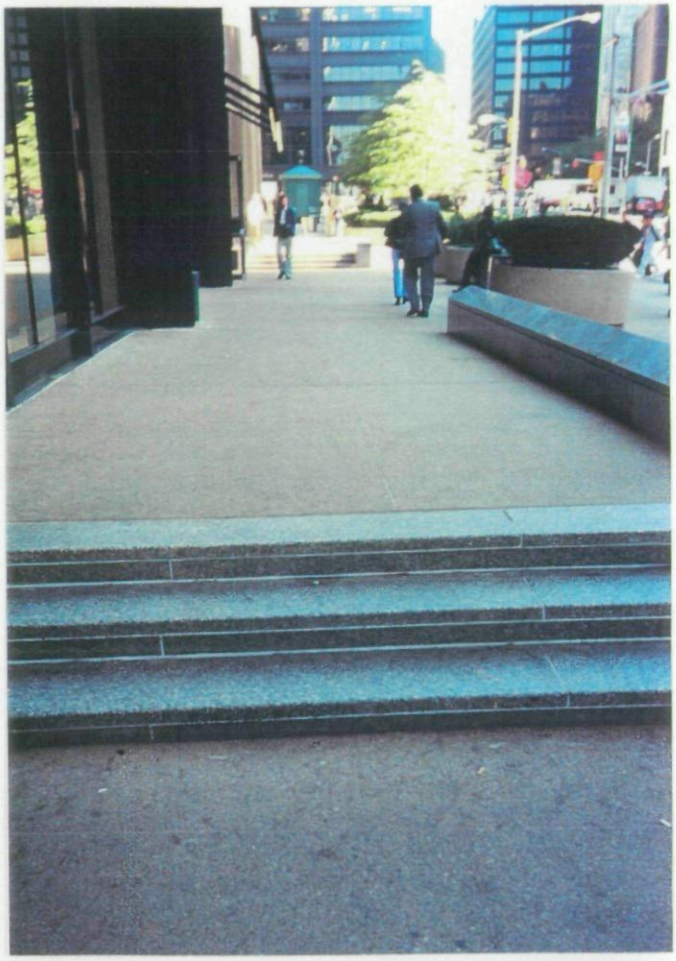
Typical granite stairway from Plaza between WTC 1 and hotel

Photograph 7

Street furniture and pavement south of WTC 2 along Liberty Street

Photograph 8

New granite pavement south at 2 WTC entrance



Photograph 9

Sidewalk and steps south of 4 WTC at Liberty and Church Street

Photograph 10

Street furniture, planters, and tree wells along Church Street at 4 WTC

Photograph 11

Ramped entrance from Church Street looking west into Tobin Plaza

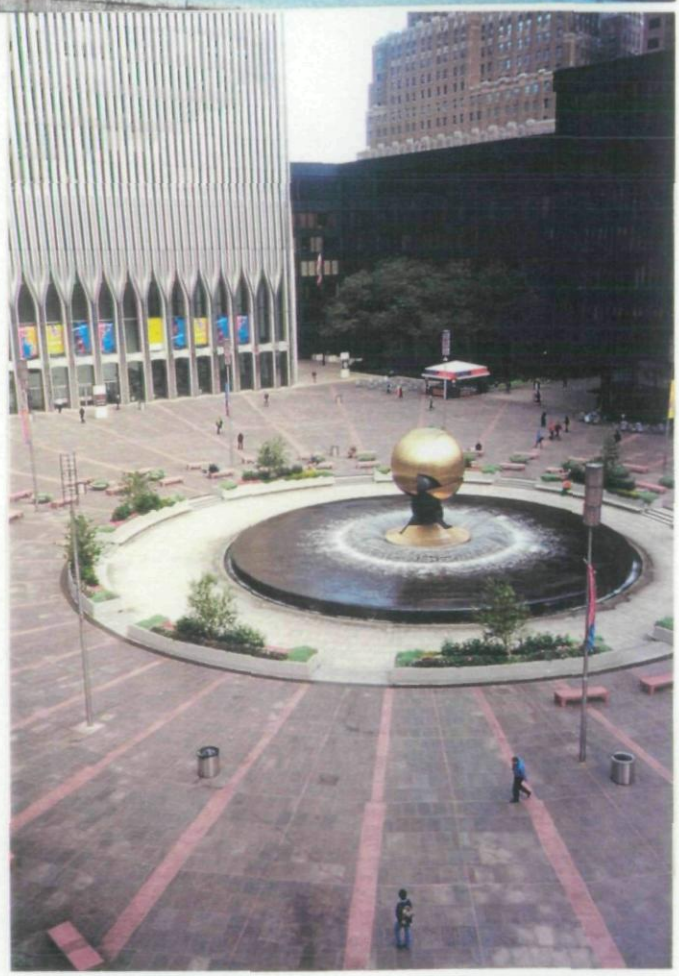
Photograph 12

Church Street steps entering Plaza

87

Photograph 13

Sculpture at entrance to Plaza on Church Street



Photograph 14

Overview of Plaza from 4WTC

86

Photograph 15

Damaged Plaza pavement under overhang for 4 WTC

Photograph 16

Planter damage at Plaza level near 4 WTC

85

Photograph 17

Expansion joint in Plaza deck along east side near Church Street

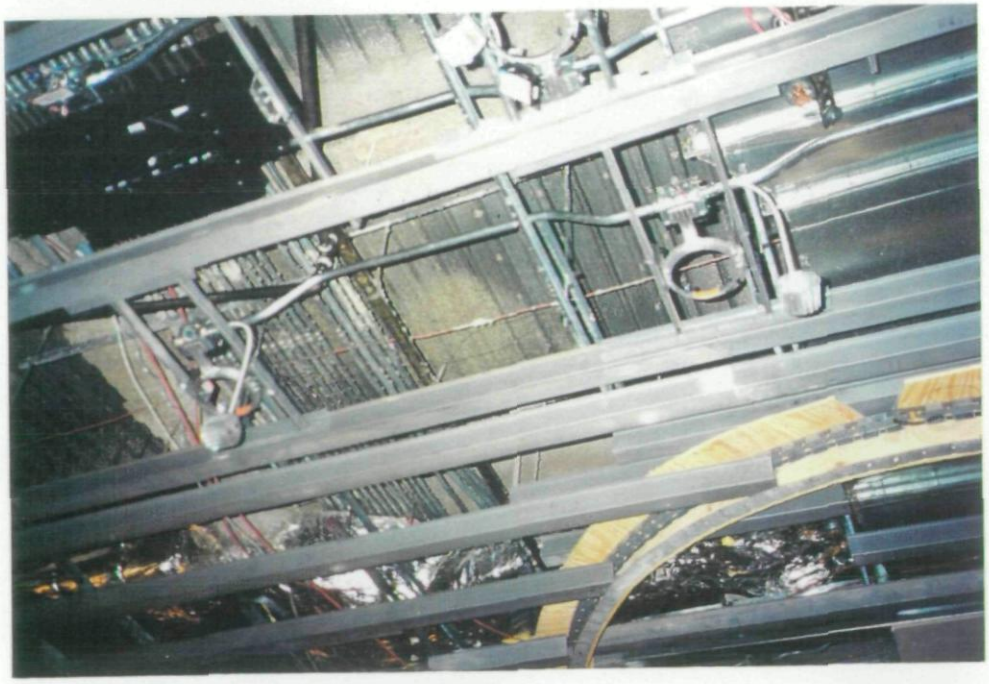
Photograph 18

Leaks at underside of Plaza deck visible near 1 WTC entrance

84

Photograph 19

Structure of Concourse level visible from 4 WTC mechanical room on B1 level



Photograph 20

Metal deck and framing for Plaza level visible from construction area in Concourse level

83

Photograph 21

Steel framing and metal deck for 3rd Floor framing visible in vacant retail space at 4WTC Plaza level

Photograph 22

Exterior finishes and space under overhang being used for restaurant seating

Photograph 23

Detail of exterior structure and finishes at 5 WTC

Photograph 24

Doors to northeast building entrance occur on a level between the Concourse and the Plaza

Photograph 25

Mall entrance detail along Vesey Street – Note exterior escalators to Plaza level on the right

Photograph 26

Retail showcase windows at Liberty Street side

80

Photograph 27

Example of displaced marble panels to be monitored for further movement

Photograph 28

Damaged marble panel near bottom of exterior stairway between 1 and 4 WTC

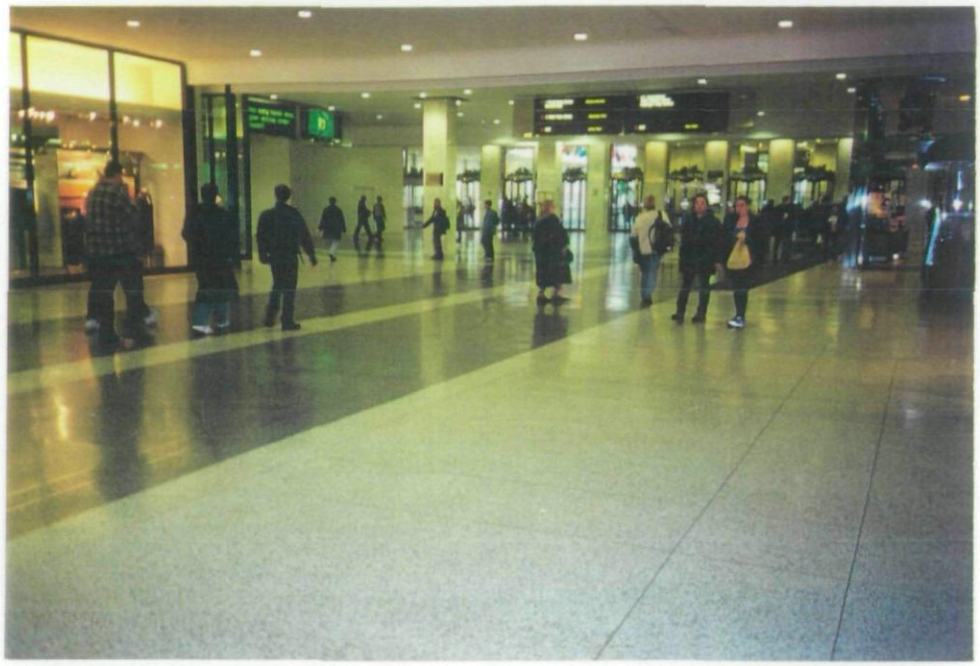
79

Photograph 29

Central area of Concourse level at head of PATH escalators

Photograph 30

Old travertine flooring in an area scheduled to be replaced with terrazzo



Photograph 31

New terrazzo flooring in the north Concourse corridor looking west towards 1 WTC

Photograph 32

New terrazzo *flooring in west* corridor looking south towards 2 WTC

Photograph 33

South corridor with original finishes looking east from 1 WTC

Photograph 34

Intersection of *south and east* corridors with original finishes

76

Photograph 35

Central corridor looking north towards PATH entrance area

Photograph 36

Central corridor looking south toward Liberty Street entrance

Photograph 37

Detail of Liberty Street entrance doors with ADA features on left

Photograph 38

Stairway and escalators at southeast building entrance

Photograph 39

Lobby to 4 WTC at Concourse level is from the retail mall area

Photograph 40

East corridor looking north

Photograph 41

Central corridor looking west

Photograph 42

North corridor looking east

Photograph 43

5 WTC lobby is accessed by stairway and ADA ramp from *mall at* Concourse level

Photograph 44

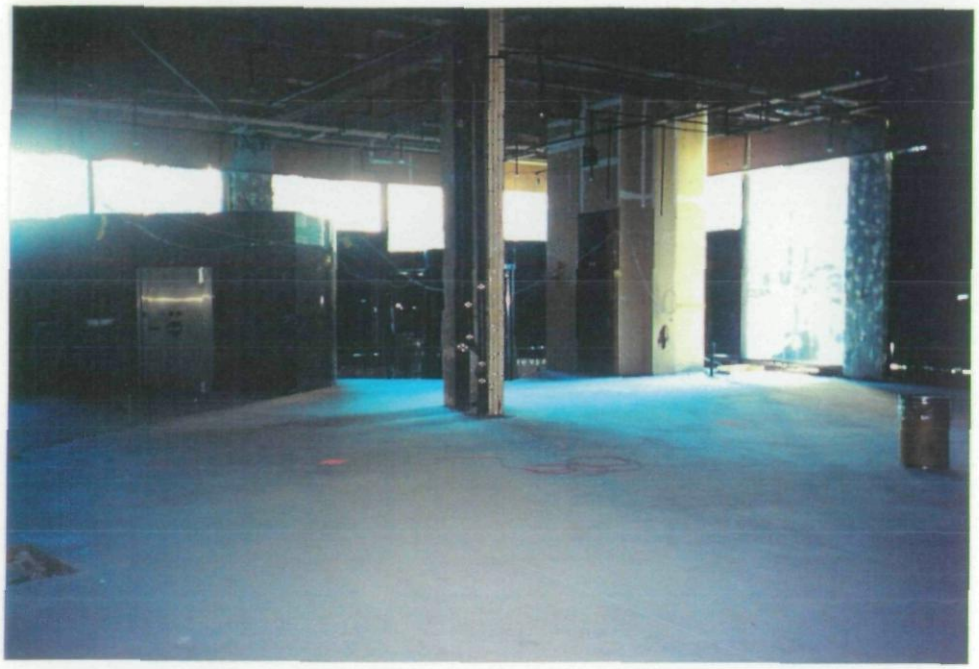
Grade level entrance at *northwest corner* of complex occurs between Plaza and Concourse levels below the 5 WTC *building*

Photograph 45

Entrance from Plaza side at 5 WTC

Photograph 46

Entrance to NYC subway system from eastern corridor



Photograph 47

Vacant retail space at Plaza level below 4 WTC

Photograph 48

Change in level in retail space Plaza level below 4 WTC

69

Photograph 49

Rear service corridor at Concourse level east side

Photograph 50

Elevator lobby at 4 WTC 3rd Floor

Photograph 1

Entrance pylon at Church Street Plaza entry

Photograph 2

Existing structure below building at B-2 level remaining from PATH station

Photograph 3

Typical building structure with 30' column bays, cantilever at perimeter, steel framing and metal deck

Photograph 4

Spray applied fireproofing at framing

Photograph 5

Double girder used on either side of column to frame cantilever

Photograph 6

Framing of cantilever below 4th floor deck

Photograph 7

Aluminum cladding conceals steel truss to support cantilever at 4th floor overhang

Photograph 8

East and north elevations

Photograph 9

North and west elevations from roof of 5WTC

Photograph 10

Supplementary stair tower added in 1995-96 to serve trading room on 8th floor

Photograph 11

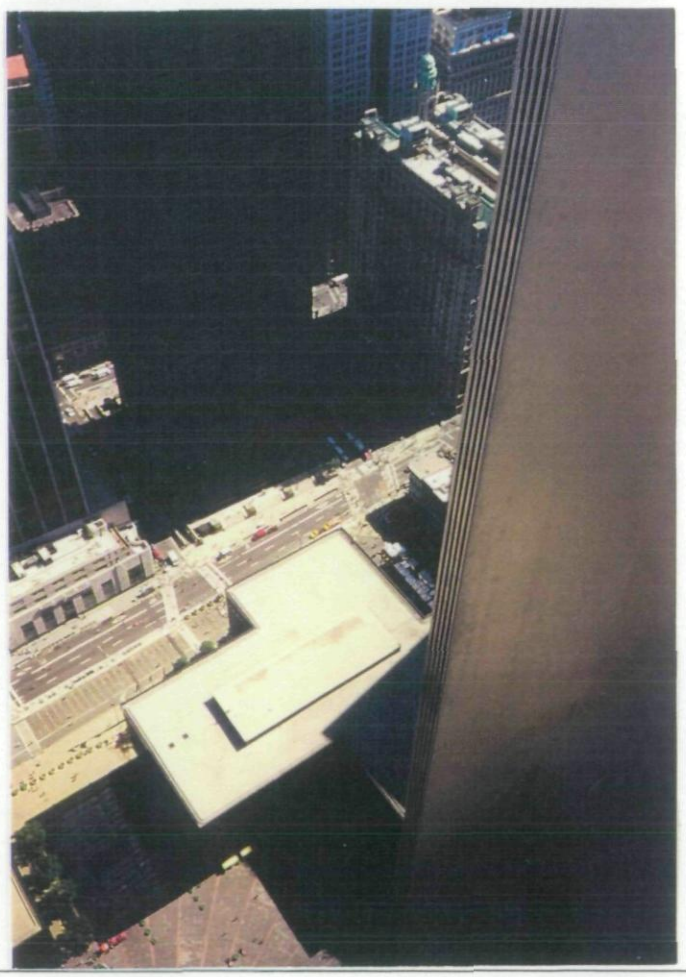
West and south elevations

Photograph 12

South and east elevations

Photograph 13

Detail of sill condition at 4th floor where painted finish is failing



Photograph 14

Roof layout overview from tower

Photograph 15

Main field of roof with mechanical penthouse, window washing rig track and parapets visible

Photograph 16

Southeast stairway exiting into well at roof partially blocked by debris

60

Photograph 17

Concourse level elevator lobby

Photograph 18

Main entrance at Plaza level from Church Street. Escalator at right connects to Concourse level

Photograph 19

Plaza level elevator lobby

Photograph 20

Typical office floor elevator lobby

58

Photograph 21

Office floor corridor finishes

Photograph 22

Office space along window wall

Photograph 23

Representative office space

Photograph 24

Typical rest room finishes

Photograph 25

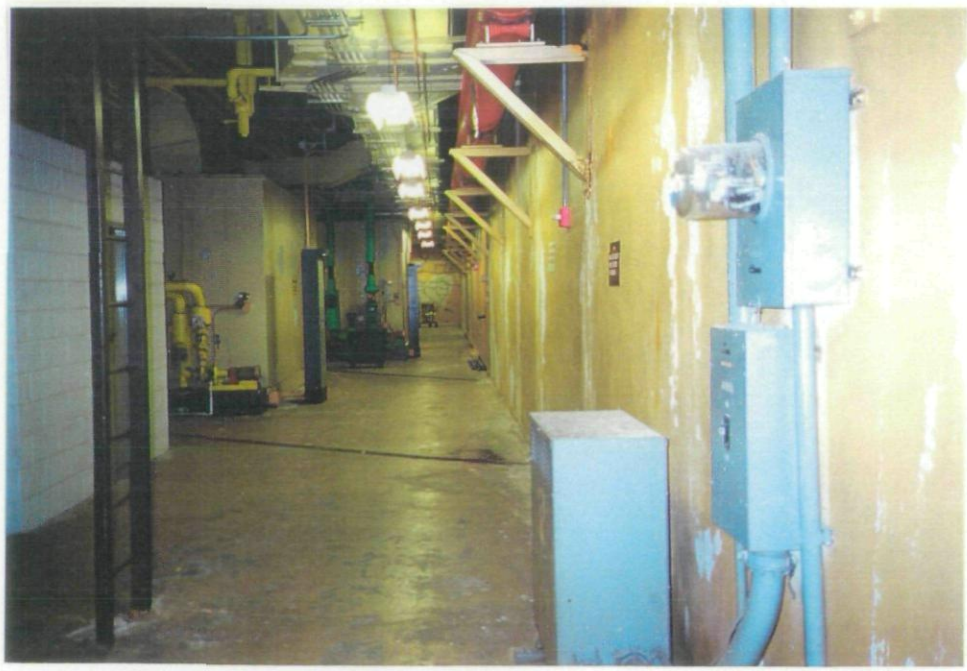
Typical rest room finishes

Photograph 26

Stairway finishes

Photograph 27

Mechanical equipment room finishes on 9th floor



Photograph 28

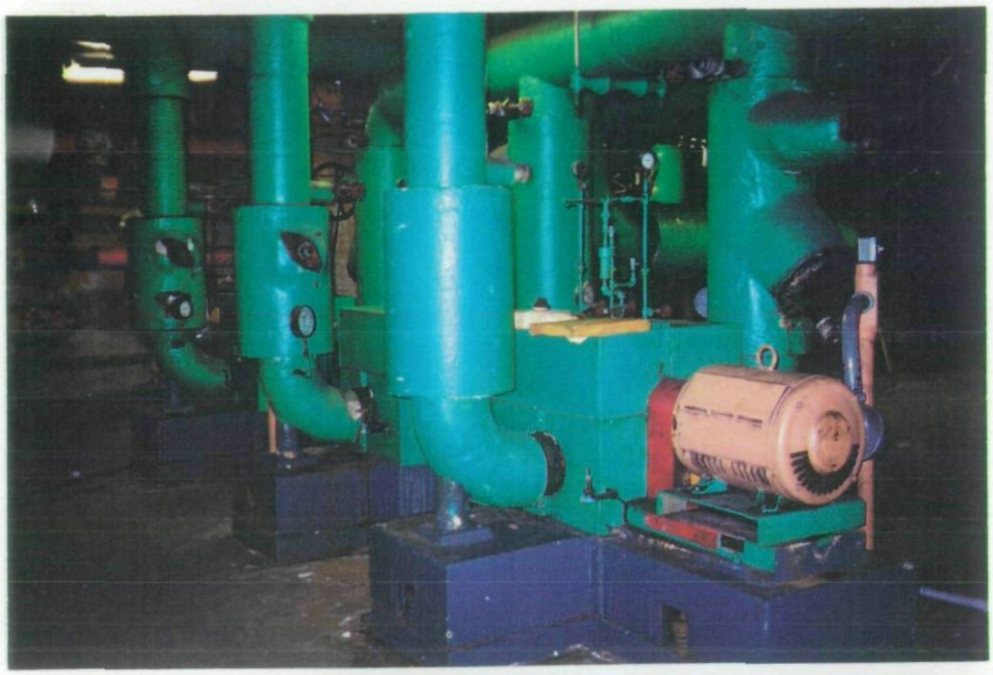
Mechanical equipment room finishes on 9th floor

Photograph M1

Typical perimeter induction unit with a chilled/hot water coil

Photograph M2

***Air handling unit* located in the 3rd floor mechanical room**

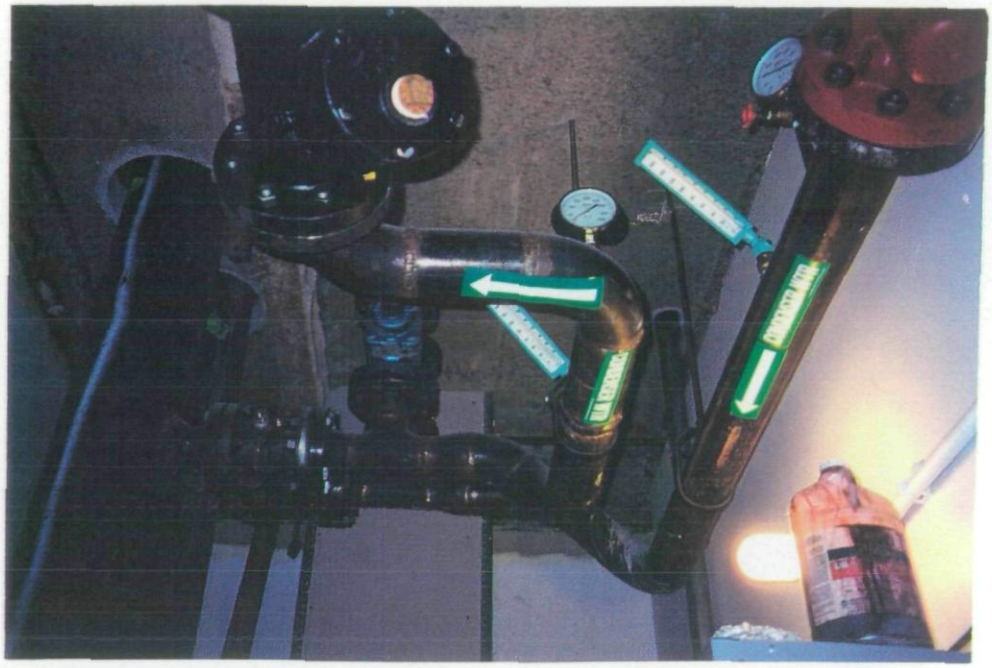


Photograph M3

Chilled water pumps located in the B1 mechanical room

Photograph M4

Plate and frame heat exchangers for chilled water located in the B1 mechanical room



Photograph M5

Condenser water supply and return lines for tenant supplementary air conditioning

Photograph M6

Heat exchanger and circulating pump for heating hot water

Photograph M7

Ejectors and tanks located in the B1 mechanical room

Photograph M8

Steam domestic water heaters with circulating pumps

Photograph M9

Electric circuit breaker panels in a typical electric closet

Photograph M10

Typical elevator lobby without a wall plaque showing the location of exit stairs to be used in the event of a fire

Photograph M11

Booster fire pump located in the 9th floor mechanical room

Photograph M12

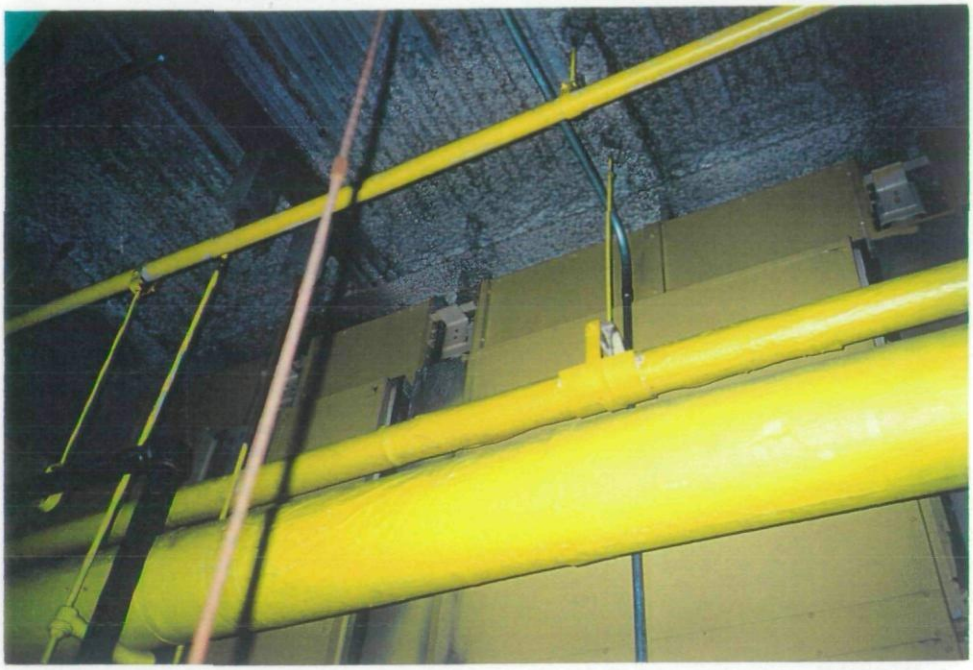
Variable frequency drive controllers for the air handler supply fans in the 3rd floor mechanical room

Photograph 1

Entrance pylon at Church Street Plaza entry

Photograph 2

Existing structure at 8th floor below the MER. Spray-applied fireproofing and rigid panel sound insulation are visible

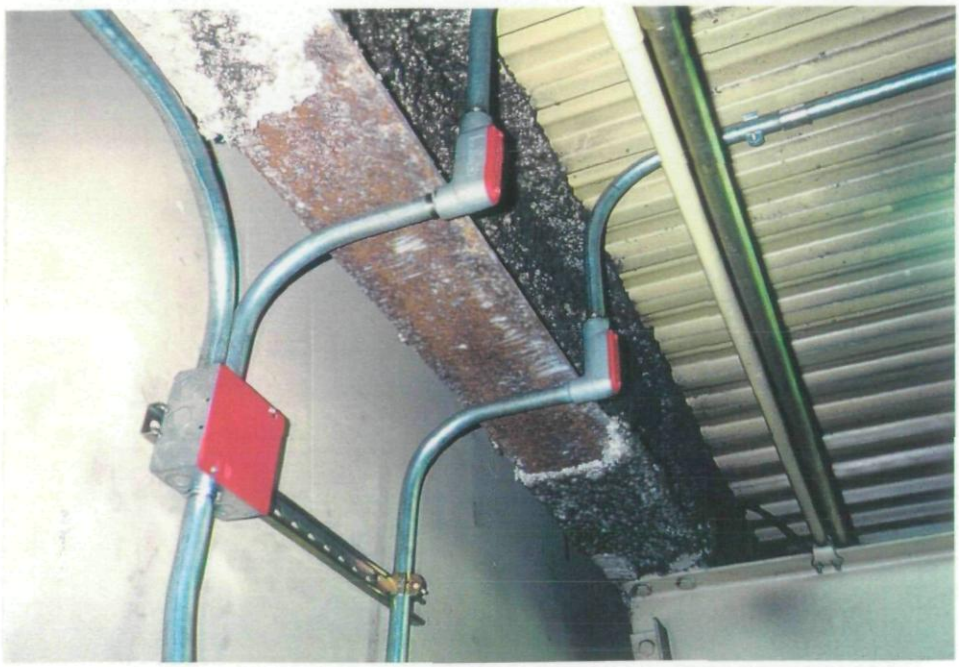


Photograph 3

Roof deck structure with lally-column supports of exterior wall visible at 9th Floor MER

Photograph 4

Roof deck visible at 9th Floor MER Customs House



Photograph 5

Example of spray applied fireproofing removed at framing for attachment of equipment

Photograph 6

Structure of B1 Level at loading docks which also services 4WTC

Photograph 7

East elevation

Photograph 8

Northeast corner from Church and Vesey Streets

44

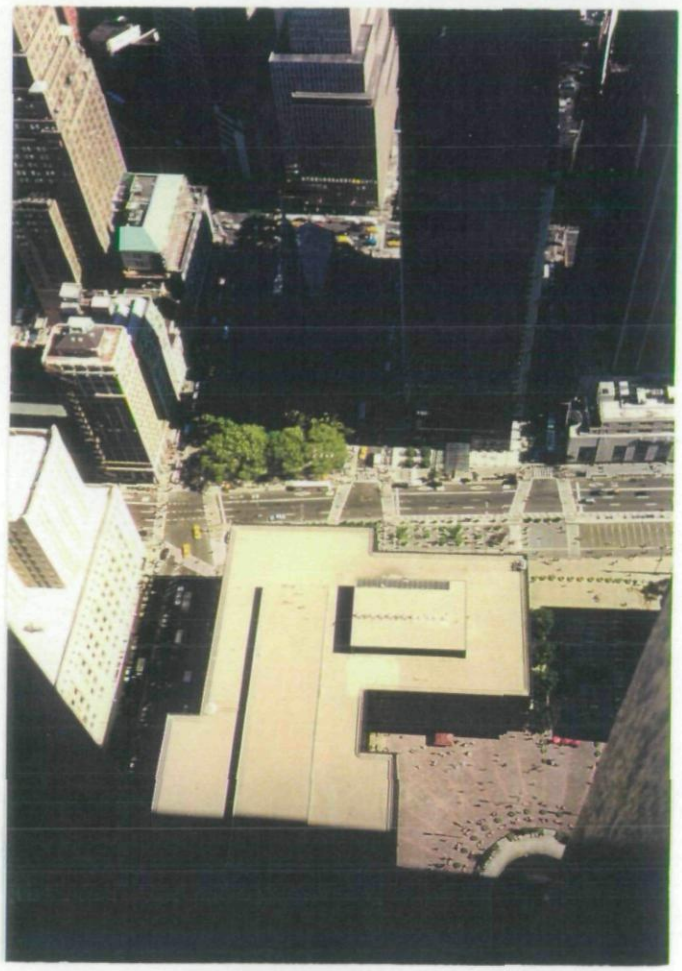
Photograph 9

North elevation

Photograph 10

South and west elevations from roof of 4WTC

43



Photograph 11

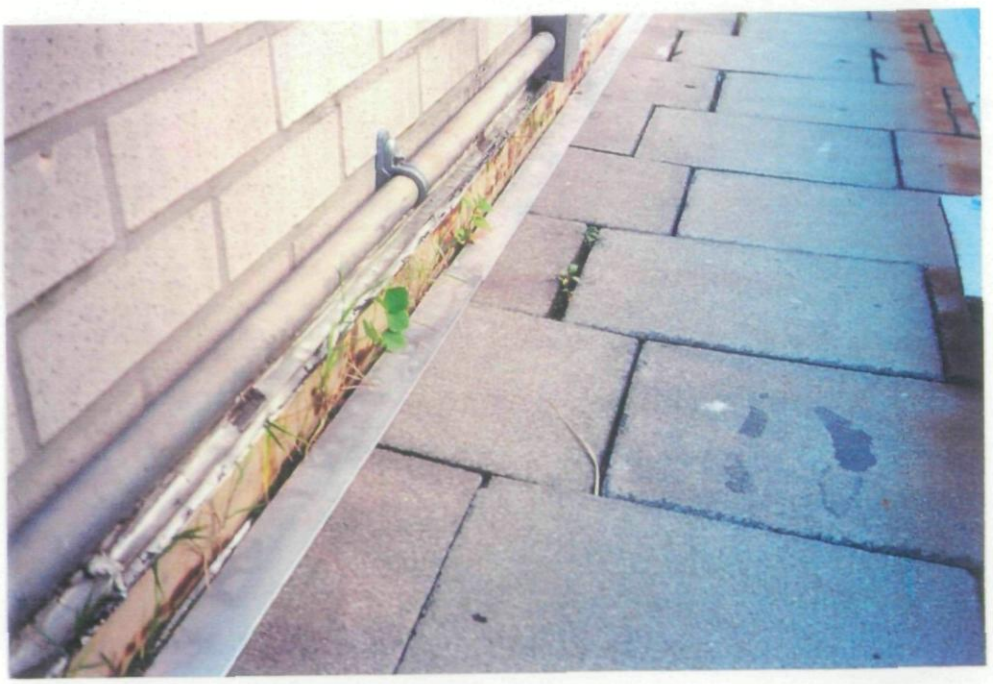
Roof layout overview from tower

Photograph 12

Main field of roof with mechanical penthouse, window washing rig track and parapets visible

Photograph 13

Detail of roof drain with vegetation growth supported by the moisture held in paver backing



Photograph 14

Detail of perimeter flashing detail with vegetation growth

Photograph 15

Penthouse roof with pavers removed for patching of membrane

Photograph 16

Severely rusted underside of roof deck from previous roof leaks

Photograph 17

Concourse level stair and ramp entrance from retail mall

Photograph 18

Concourse level entrance

39

Photograph 19

Plaza level lobby

Photograph 20

Office floor corridor finishes

38

Photograph 21

Office space along window wall

Photograph 22

Representative office space

37

Photograph 23

Typical rest room finishes

Photograph 24

Typical rest room finishes

Photograph 25

Stairway finishes

Photograph 26

Mechanical equipment room finishes on 9th floor

Photograph 27

Freight elevator lobby finishes on 9th floor

Photograph 28

Stored debris blocking corridor on B1 level

34

Photograph M1

Typical air handling unit located in the 9th floor mechanical room

Photograph M2

Chilled water supply line from the central plant

33

Photograph M3

Typical return air fan located in the 9th floor mechanical room

Photograph M4

Steam pressure reducing station

32

Photograph M5

Secondary chilled/heating hot water pumps located in the 9th floor mechanical room

Photograph M6

Heat exchangers and circulating pumps for heating hot water system

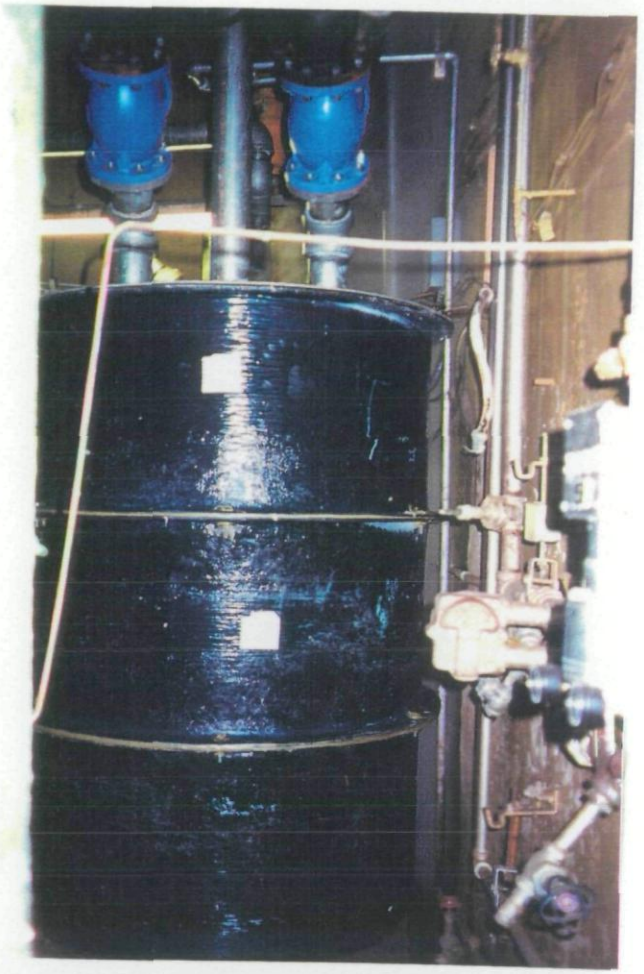
31

Photograph M7

Steam condensate pumps and receiver

Photograph M8

Domestic water supply pumps

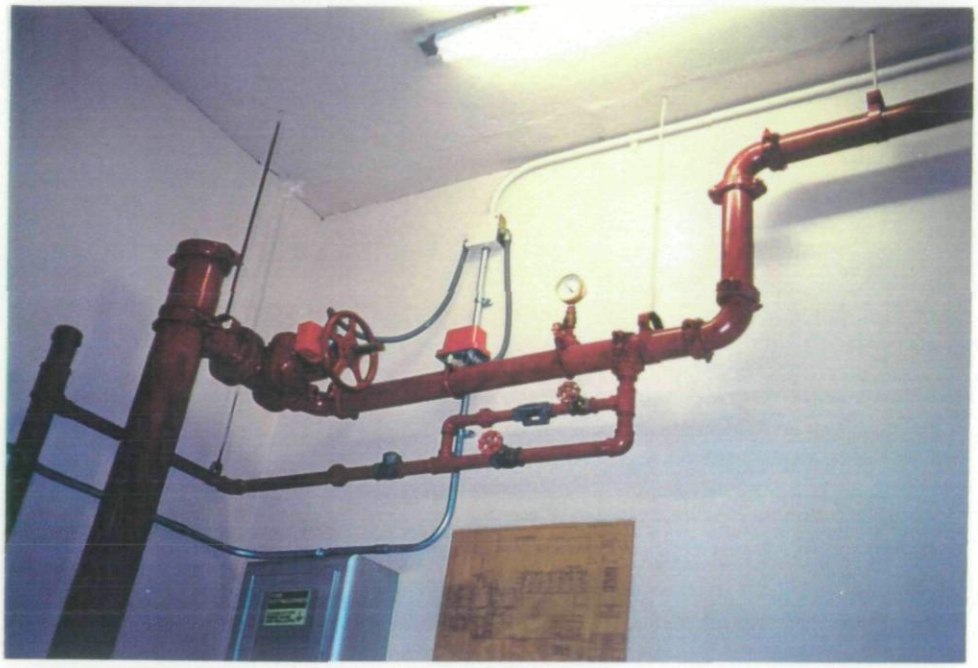


Photograph M9

Ejector pumps and tank

Photograph M10

Steam domestic water heaters and circulating pumps



Photograph M11

Standpipe riser with sprinkler supply, and flow and tamper switches

Photograph M12

Typical office floor corridor with exit sign, manual pull station, audio/visual alarm, and fire warden station

Photograph 1

River water pumps in the remote pumping station

Photograph 2

Traveling screen filter for the river water system

Photograph 3

River water piping within the complex

Photograph 4

River water strainers for the closed loop condenser water systems

Photograph 5

Main chiller #3

Photograph 6

Main chiller # 7 (split for high and low zone)

Photograph 7

Chilled water pumps

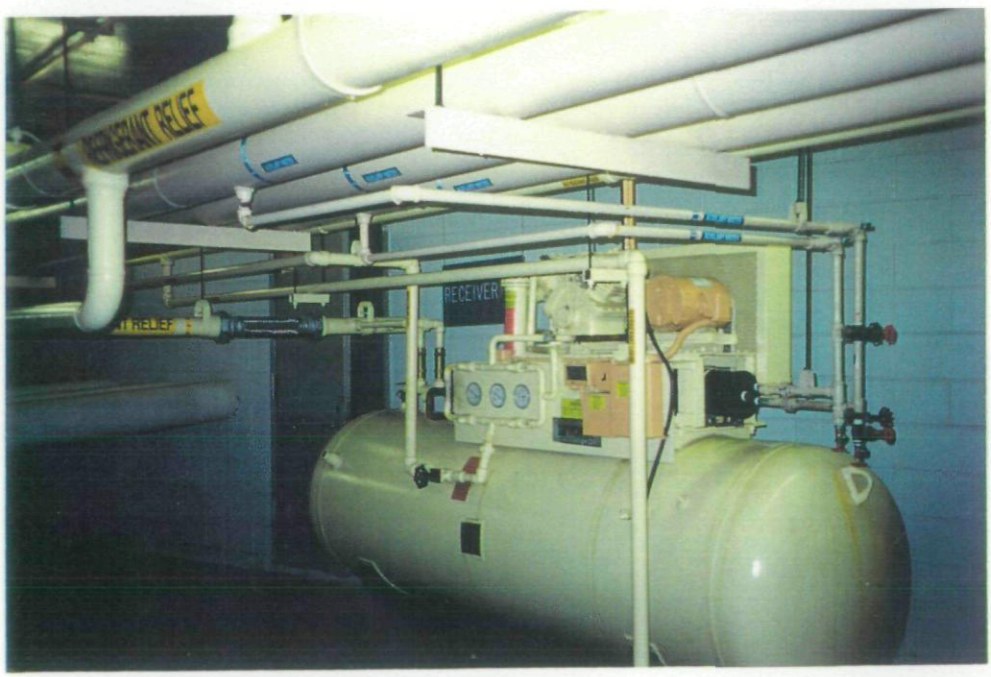
Photograph 8

High and low zone chilled water piping

24

Photograph 9

Supplemental chillers

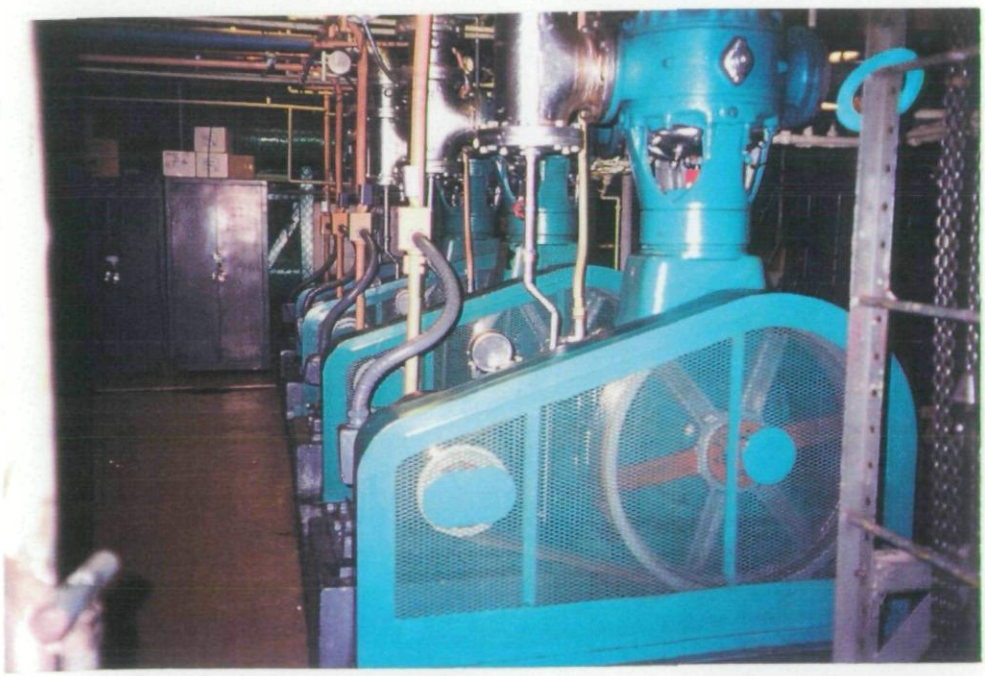


Photograph 10

Refrigerant storage tanks

Photograph 11

Heat exchanger for economizer operation



Photograph 12

Pneumatic control air compressors

Photograph 13

Steam pipe rack

Photograph 14

Steam service valve (planned for replacement)

Photograph 15

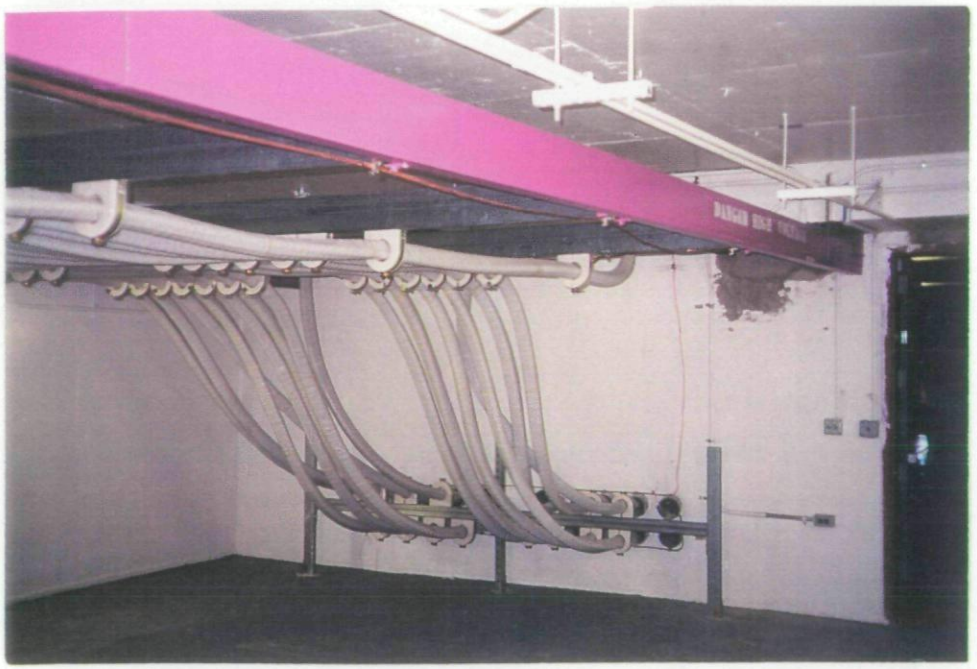
Steam distribution plant

Photograph 16

One of the main water service meters

Photograph 17

Switchgear within the Primary Distribution Center



Photograph 18

Recently upgraded high voltage feeders

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Photograph 19

Upgraded electrical substation

Photograph 20

Electrical distribution bus ducts (new and old) from a substation

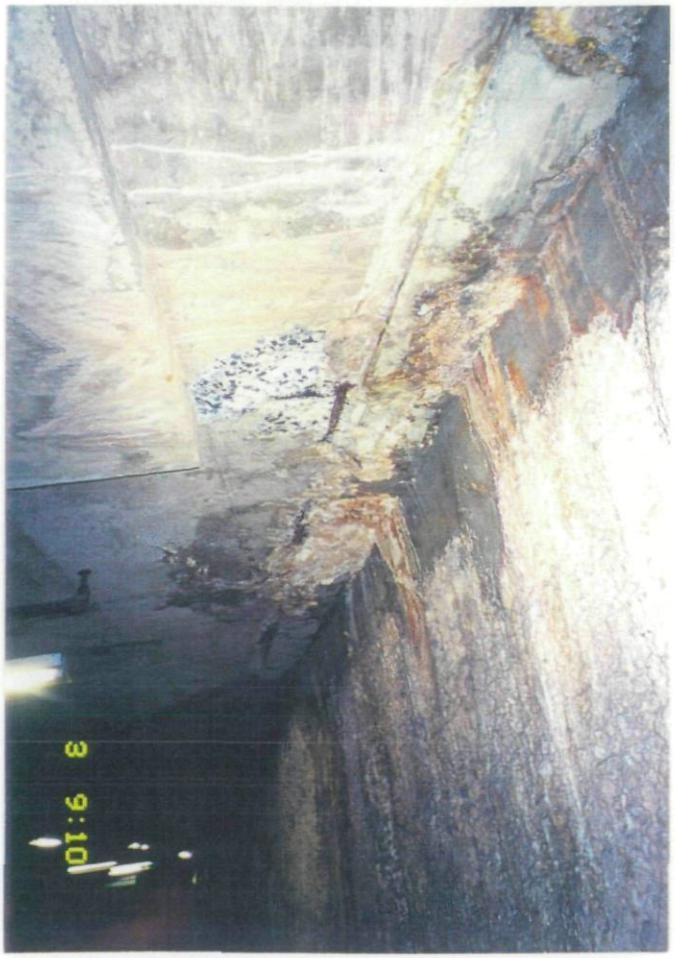
18

Photograph 1

Slurry wall exposed in Level B5

Photograph 2

Base of slurry wall - Level B6



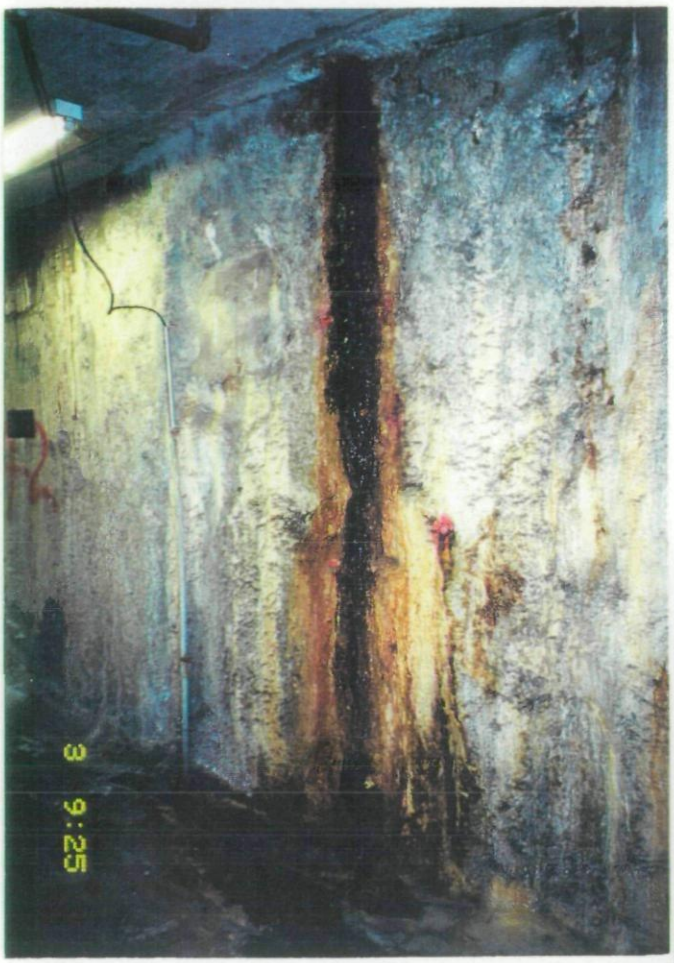
Photograph 3

Ceiling slab spalling at slurry wall

Photograph 4

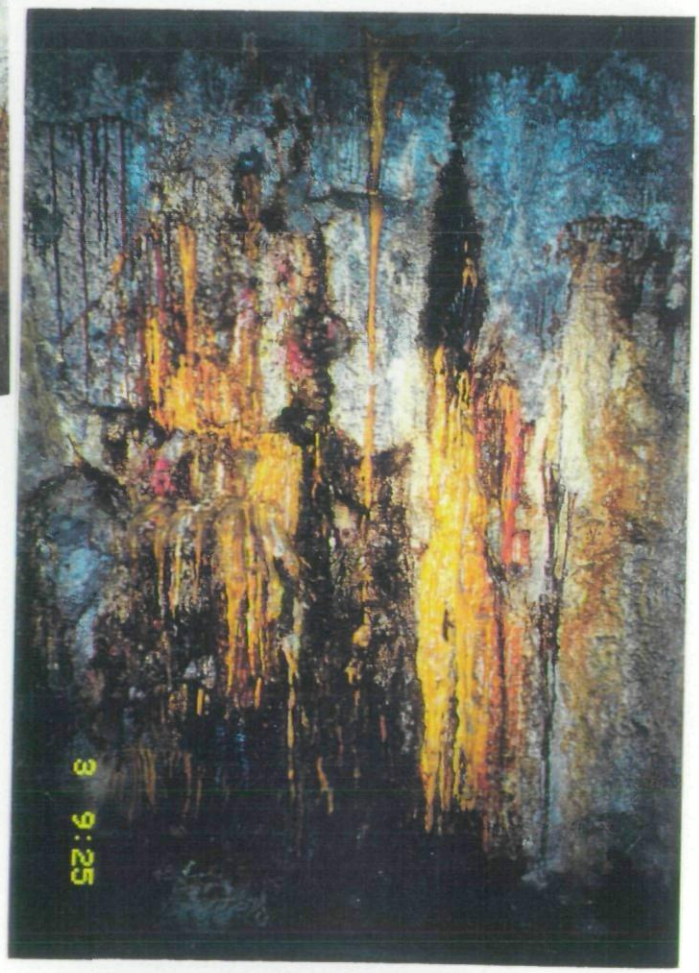
Ventilation plenum typical - runs along north, east, and south walls of garages at Levels B2 - B4

16



Photograph 5

Leakage stains on slurry walls



Photograph 6

Stains on slurry wall and patches for leaks

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Photograph 7

Spalling garage slab - Level 2, North

Photograph 8

Spalling slab in B5 Central Plant

14

Photograph 9

New slab being installed in loading dock area - start of multi-stage program

Photograph 10

Loading dock area

Photograph 11

Loading dock area for US Customs Buildings

Photograph 12

Missing fireproofing at loading dock

12

Photograph 13

Missing fireproofing at ventilation plenum - B2 North

Photograph 14

Missing fireproofing at B-2 Garage

Photograph 15

Leased offices at former parking area (B1) for Marriott Hotel

Photograph 16

Repairs of ceiling slab at B2 ceiling due to bomb explosion

10

Photograph 17

Repairs at column brackets to support weakened slabs

Photograph 18

New ceiling slab installed above refrigeration plant due to bomb blast

Photograph 19

Ceiling under B4 ramp (south) in ventilation plenum requires repairs

Photograph 20

Level B2 slab spalling (at ramp)

8

8

Photograph 21

Stair in projection serves as PATH emergency exit

Photograph 22

Typical subgrade stair requires cleaning and some require painting

Photograph 23

B5 and B6 storage spaces

Photograph 24

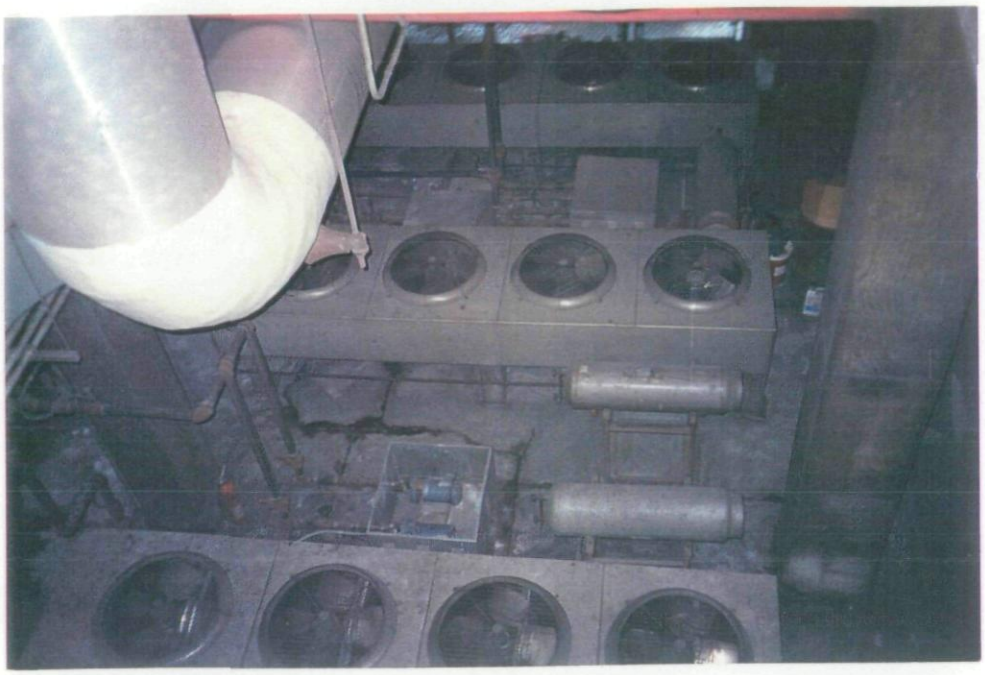
B4 northeast stair door being replaced

Photograph M1

Heating and ventilating unit in the loading dock area

Photograph M2

Window style air conditioning unit used in the parking office



Photograph M7

Tenant air-cooled condensers in the northwest projection area

Photograph M8

Tenant emergency generator in the northwest projection area

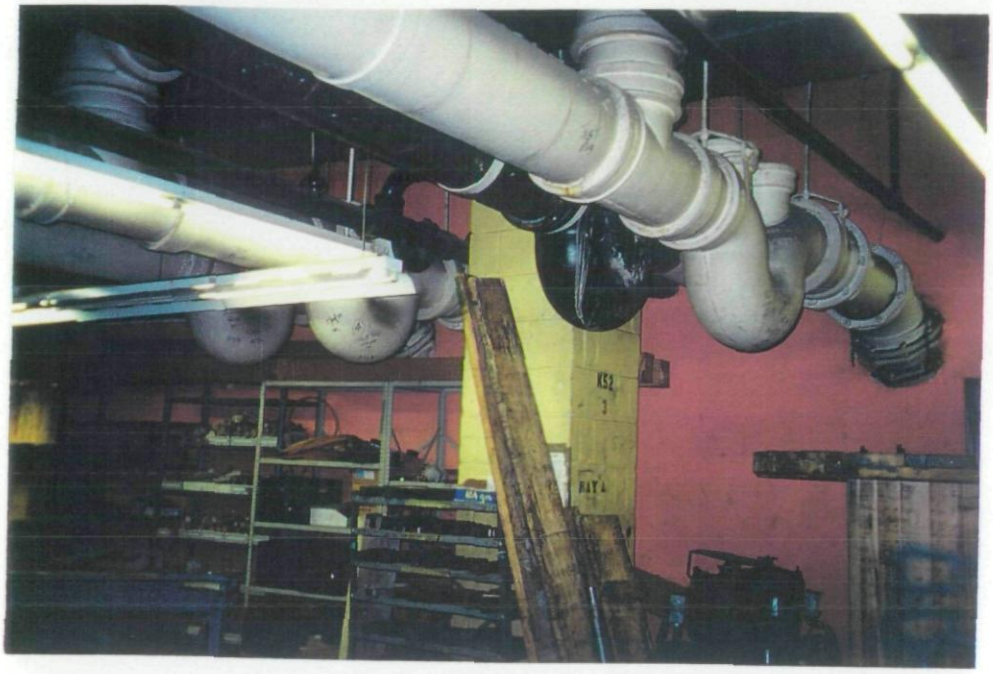
4

Photograph M9

Typical sewage ejector pit

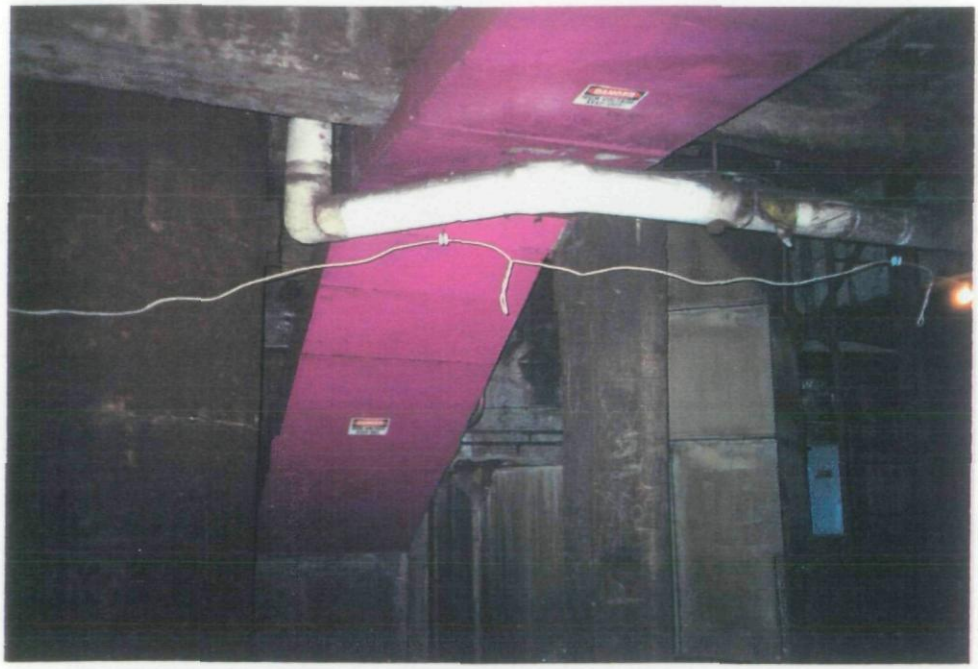
Photograph M10

Pumps within an ejector pit



Photograph M11

House traps within subgrade space



Photograph M12

High voltage electrical duct banks painted purple within the subgrade space

Photograph M13

Life safety devices within a subgrade storage area

Photograph M14

Sprinkler head in the loading dock area observed to be painted